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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,157	03/31/2004	Youn-joon Sung	030681-642	4476

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BUCHANAN, INGERSOLL & ROONEY PC
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EXAMINER

FINNEREN, RORY B

ART UNIT	PAPER NUMBER
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2828

DATE MAILED: 08/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

2/

Office Action Summary	Application No.	Applicant(s)	
	10/813,157	SUNG ET AL.	
	Examiner	Art Unit	
	Rory Finneren	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

The replacement drawing sheets were received on 23 May 2006. These drawings are acceptable.

Response to Amendment

Acknowledgment is made of amendments to claims 1 and 11. Claims 1-23 are pending.

Response to Arguments

Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of the new ground(s) of rejection.

In contrast to applicant's arguments, *Kozaki* does disclose, as outlined below, a buried layer having a contact hole as recited in claims 1 and 11. Although there may be differences in the structural relationships between the layers of the present invention and the layers of the *Kozaki* device, as the claims are currently worded these alleged differences do not prevent the obviousness of the independent claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-23 rejected under 35 U.S.C. 103(a) as being unpatentable over Kozaki (US 2002/00536760).

Regarding claim 1, Kozaki discloses a laser diode comprising:

- a substrate (Fig. 1, #101);
- a lower material layer formed on the substrate (#102-105);
- a resonance layer formed on the lower material layer (#106-109);
- an upper material layer formed on the resonance layer and having a ridge at the top (#110-111);
- a buried layer formed on the upper material layer and having a contact hole corresponding to the ridge of the upper material layer (#162, paragraph [0232]);
- a protective layer formed on the buried layer and having a material different from the material of the buried layer, and having an opening corresponding to the contact hole of the buried layer (#164); and
- an upper electrode formed on the protective layer to contact an upper surface of the ridge through the contact hole (#120).

Kozaki discloses the claimed invention except for the positioning of the upper electrode relative to the buried layer and protective layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to reposition the electrode so that it is formed on the protective layer, with the protective layer formed on the buried layer, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 86 USPQ 70.

Regarding claim 2, Kozaki discloses the claimed invention as outlined in claim 1, wherein the lower material layer includes: a first compound semiconductor layer stacked on the substrate (#103); and a lower cladding layer stacked on the first compound semiconductor layer (#105).

Regarding claim 3, Kozaki discloses the claimed invention, wherein the first compound semiconductor layer is an n-GaN based group III-V nitride semiconductor layer (paragraphs [0065] and [0150]).

Regarding claim 4, Kozaki discloses the claimed invention, wherein the lower cladding layer is an n-GaN/AlGaIn layer (paragraph [0154]).

Regarding claim 5, Kozaki discloses the claimed invention, wherein the resonance layer further includes:

a lower waveguide layer (#106) stacked on the lower cladding layer (#105) and having a refractive index larger than that of the lower cladding layer (paragraph [0037], lines 31-);

an active layer (#107) stacked on the upper surface of the lower waveguide layer to generate a laser beam; and

an upper waveguide layer (#109) stacked on the active layer.

Regarding claim 6, Kozaki discloses the claimed invention, wherein the refractive indexes of the upper and lower waveguide layers are lower than the refractive index of the active layer (paragraph [0037], lines 31-).

Regarding claim 7, Kozaki discloses the claimed invention, wherein the active layer is a GaN based group III-V nitride compound semiconductor layer of $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{N}$ where $0 \leq x \leq 1$, $0 \leq y \leq 1$, and $x+y \leq 1$ (paragraph [0065]).

Regarding claim 8, Kozaki discloses the claimed invention, wherein the upper material layer includes:

an upper cladding layer (#110) stacked on the upper waveguide layer and having a ridge (paragraph [0126] and Fig. 1) and a refractive index smaller than that of the upper waveguide layer (paragraph [0037], lines 31-);

a second compound semiconductor layer formed on the ridge (#111, paragraph [0166]).

Regarding claim 9, Kozaki discloses the claimed invention, wherein the upper cladding layer is a p-GaN/AlGaN layer (paragraph [0164]).

Regarding claim 10, Kozaki discloses the claimed invention, wherein the second compound semiconductor layer is a p-GaN based group III-V nitride semiconductor layer (paragraph [0166]).

Regarding claim 11, Kozaki discloses a manufacturing method of a laser diode, the method comprising:

forming a laser oscillating structure including a substrate (#101), a resonance layer on the substrate (#106-109), and cladding layers (#105, 110) formed on and under the resonance layer and having a ridge protruding to a predetermined height (paragraph [0126], Fig. 1);

forming a buried layer on top of the structure to cover the surface of the ridge (#162, paragraph [0232]);

sequentially forming a protective layer (#164) and an etch back material layer on the surface of the buried layer;

etching the etch back material layer by an etch back process to a predetermined depth to expose a portion of the protective layer at the upper direction of the ridge (paragraphs [0167]-[0174]);

removing the portion of the protective layer, which is not covered by the etch back material layer, by using an etchant to form an opening which exposes a portion of the surface of the buried layer on the ridge (paragraphs [0167]-[0174]);

removing the etch back material layer remaining on the buried layer (paragraphs [0167]-[0174]);

forming a contact hole by etching the portion of the buried layer, which is exposed through the opening of the protective layer (paragraphs [0167]-[0174]); and

forming an upper electrode that contacts to the top surface of the ridge through the contact hole on the protective layer (#120, (paragraphs [0167]-[0174])).

Regarding claim 12, Kozaki discloses the claimed method, wherein the forming of the layer oscillating structure further includes:

forming a lower material layer including a lower cladding layer, on the substrate (#102-105);

forming a resonance layer including an active layer, on the lower material layer (#106-109); and

forming an upper material layer (#110-111), which includes an upper cladding layer and a contact layer and having the ridge protruding to a predetermined height, on the resonance layer.

Regarding claim 13, Kozaki discloses the claimed method, wherein the forming of the lower material layer further includes:

forming a first compound semiconductor layer on the substrate (#103, paragraph [0150]); and

forming the lower cladding layer on the first compound semiconductor layer (#105, paragraph [0153]).

Regarding claim 14, Kozaki discloses the claimed method, wherein the first compound semiconductor layer is formed on n-GaN based group III-V nitride (paragraphs [0065] and [0150]).

Regarding claim 15, Kozaki discloses the claimed method, wherein the lower cladding layer is formed of n-GaN/AlGaN (paragraph [0154]).

Regarding claim 16, Kozaki discloses the claimed method, wherein the forming of the resonance layer further includes:

forming a lower waveguide layer (#106) having a refractive index larger than that of the lower cladding layer (paragraph [0037], lines 31-), on the lower cladding layer (#105);

forming an active layer that generates a laser beam (#107), on the lower waveguide layer; and

forming an upper waveguide layer (#109) on the active layer.

Regarding claim 17, Kozaki discloses the claimed method, wherein the upper and lower waveguide layers are formed of materials having refractive indexes smaller than that of the active layer (paragraph [0037], lines 31-).

Regarding claim 18, Kozaki discloses the claimed method, wherein the upper (paragraph [0162]) and lower waveguide layers (paragraph [0156]) are formed of GaN based group III-V compound.

Regarding claim 19, Kozaki discloses the claimed method, wherein the active layer is formed of GaN based group III-V nitride compound of $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{N}$ where $0 \leq x \leq 1$, $0 \leq y \leq 1$, and $x+y \leq 1$ (paragraph [0065]).

Regarding claim 20, Kozaki discloses the claimed method, wherein the forming of the upper material layer further includes:

forming an upper cladding layer (#110) having a refractive index smaller than that of the upper waveguide layer (paragraph [0037], lines 31-), on the upper waveguide layer; and

forming a second compound semiconductor layer on the upper cladding layer (#111, paragraph [0166]).

Regarding claim 21, Kozaki discloses the claimed method, wherein the upper cladding layer is formed of p-GaN/AlGaN (paragraph [0164])

Regarding claim 22, Kozaki discloses the claimed method, wherein the second compound semiconductor layer is formed of p-GaN based group III-V nitride (paragraph [0166]).

Regarding claim 23, Kozaki discloses the claimed method, further including forming a lift-off layer having an opening at a portion corresponding to the ridge, on the second material layer, after the etch back material layer is removed and before the contact hole is formed (paragraph [0171]).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rory Finneren whose telephone number is (571) 272-2243. The examiner can normally be reached on Mon. - Fri. 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Oh Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Minsun Harvey
Supervisory Patent Examiner
Art Unit 2828

RBF